



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,030	10/23/2003	Syun-Ming Jang	TS02-130	6421
7590 11/15/2004				
STEPHEN B. ACKERMAN		EXAMINER		
28 DAVIS AVENUE		LEE, CALVIN		
POUGHKEEPSIE, NY 12603				
		ART UNIT		PAPER NUMBER
		2825		

DATE MAILED: 11/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/692,030

Applicant(s)

JANG et al.

Examiner

Lee, Calvin

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10/14/04 (Election).
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) 32-45 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-15 is/are allowed.
- 6) ☒ Claim(s) 16-26 and 28 is/are rejected.
- 7) ☒ Claim(s) 27 and 29-31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/29/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

OFFICE ACTION

Response to Election

1. Claims 32-45 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected device group II, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 10/14/04.

Claim Rejections - 35 U.S.C. § 102 or 103

2. The following are quotations of 35 U.S.C. 102(e) and 103(a) which form the basis for all rejections set forth in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Note: This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 16-26 and 28 are rejected under 35 USC 102(e) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over *Pan et al* (US 2004/0023497) in view of *Sukharev et al* (US 6,114,259).

Pan et al discloses a method of forming a dielectric material layer, comprising of:

- sequentially forming one dielectric material sub-layer 12 over a structure [Fig. 1B]
- treating the dielectric material sub-layer with a respective hydrogen treatment [Fig. 3 and ¶ 0023]
- forming an uppermost dielectric material sub-layer 14 over the dielectric material sub-layer

Since *Pan et al* discloses that the hydrogen concentration is significantly increased by the hydrogen treatment [¶ 0026], *Pan et al* inherently teaches the hydrogen treatment of a dielectric layer resulting a hard layer formation. Nevertheless, such hard layer formation by energy treatment is known in the semiconductor processing art as evidenced by *Sukharev et al* disclosing

to treat a low k carbon doped silicon oxide dielectric layer **10** with a hydrogen treatment [col. 8, ln.1], thereby forming a hardened layer **18** on the dielectric layer's treated surface [Fig. 5].

It would have been obvious to one of ordinary skill to have modified the process of *Pan et al* by utilizing a hard layer as a result of an energy treatment for the purpose of preventing degradation of the low-k dielectric layer [col. 10].

In re claims 17-19, *Pan et al* discloses both sub-layers **12** and **14** being low-k carbon-doped oxide [¶ 0022] including SiOC [¶ 0024] (to be understood that its dielectric constant is below 3).

In re claims 20-21, *Pan et al* suggests the sub-layer **14** having a thickness of 500Å [¶ 0023]

In re claims 25-26, *Pan et al* discloses the hydrogen treatment being conducted under the following conditions: H₂ flow from 500 to 2000 sccm; temperature from 300 to 450°C; pressure from 3 to 10mTorr; time from 60 to 180 seconds; and power from 200 to 600 W [¶ 0027-0028]

Allowable Subject Matter

4. Claims 1-15 are allowed. Neither *Pan et al* nor ^{*Sukharsu et al.*} teaches or suggests the hard layer comprising a low-k dielectric material layer.

Claims 27 and 29-31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. None of the arts suggests the hard layer being an etch stop layer.

Contact Information

5. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 from 7:00 to 17:00 (Monday-Thursday). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* can be reached at (571) 272-1907.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The central fax number is (703) 872-9306 for all communications to be entered (e.g., amendments, remarks, IDS, etc.)

CL

November 5, 2004

C. Sukharsu
GROUP 1 EXAMINER
PRIMARY EXAMINER